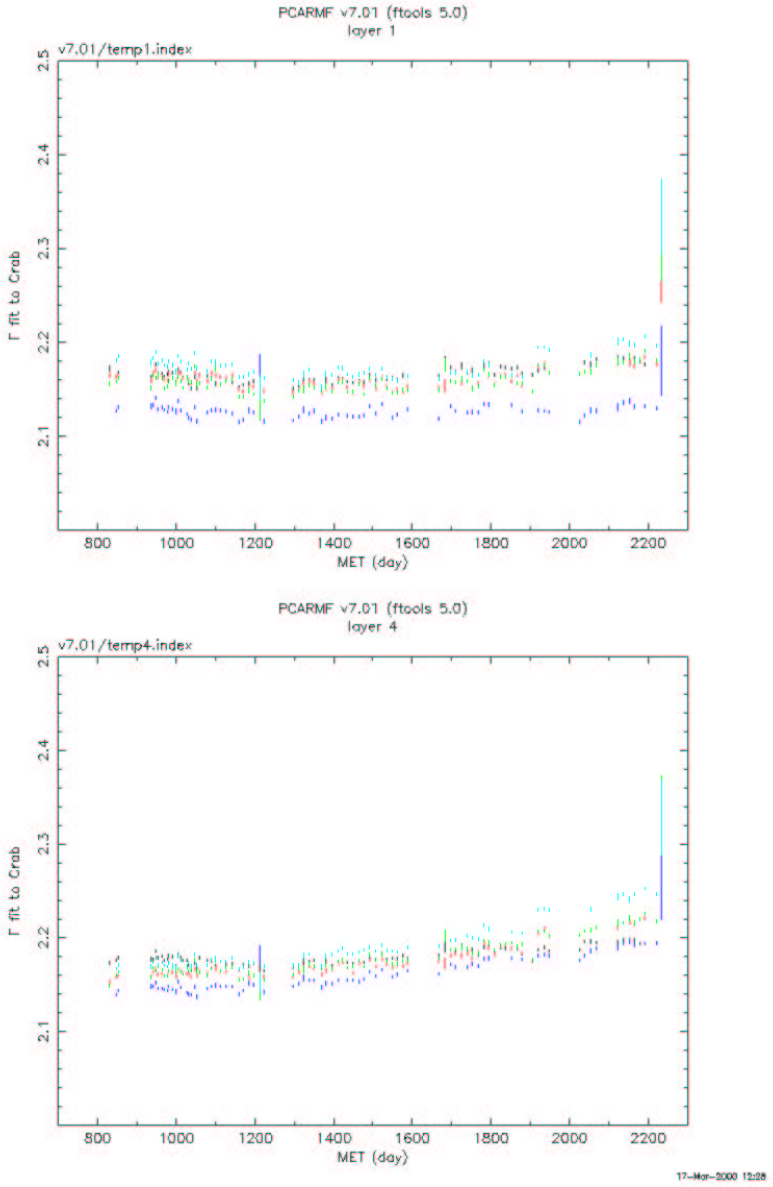
PCA response − Rossi 2000

Outline:

- Characteristics of ftools5.0/pcarmf_v7.01/pcarsp v2.43
  - variation with time
  - residuals vs Energy
  - comparison with HEXTE
- Next steps
- (Calibration input and matrix generation)

Keith Jahoda, 22 March 2000



PCA response vs Time

Power law index fit to Crab Monitoring Observations shows $\Gamma \sim 2.16$

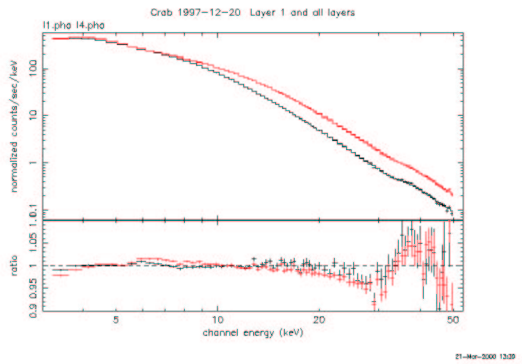
Layer 1:

PCU to PCU agreement to better than $\Delta\Gamma \sim 0.06$

Individual detectors have stability over mission lifetime $\Delta\Gamma(t) < 0.03$

Full detector:

Similar to layer 1 alone, but with trend to higher G in last two years ($\Delta\Gamma \sim 0.05$)



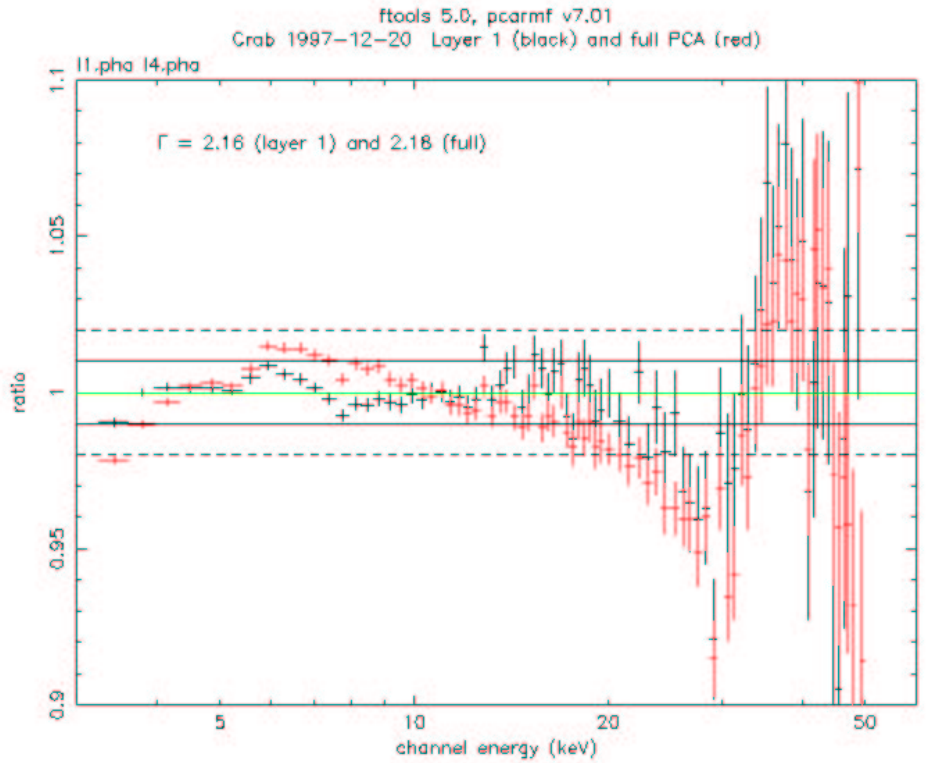
Ftools 5.0/pcarmf v7.01

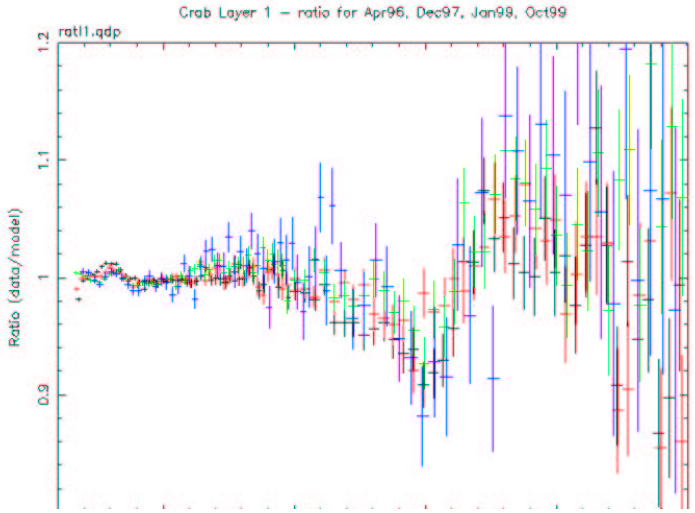
Dec 97: Power law fits to Crab give
G= 2.16 (layer 1) and 2.18 (full PCA)

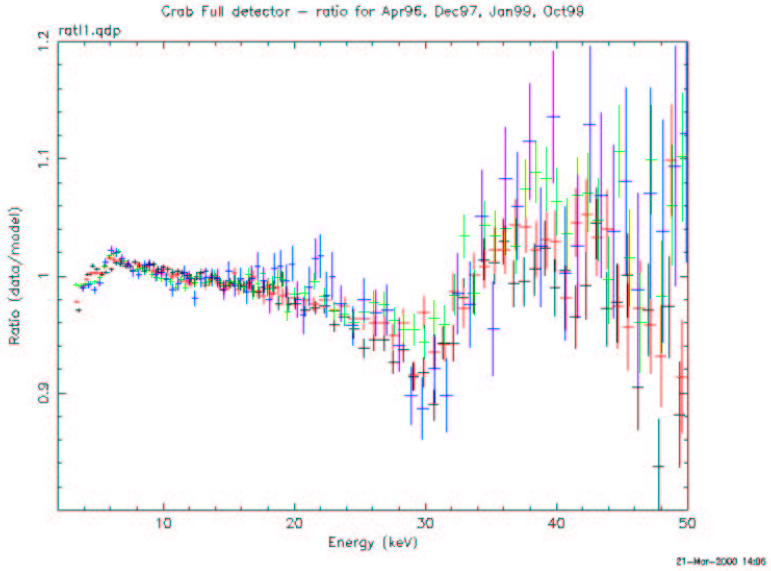
Ratio gives estimate of systematic error:

< 1% Layer 1, 3 < E < 20 keV
< 2% PCA, 3 < E < 20 keV

residuals at 6, 30 keV have equivalent width of 60, −700 eV





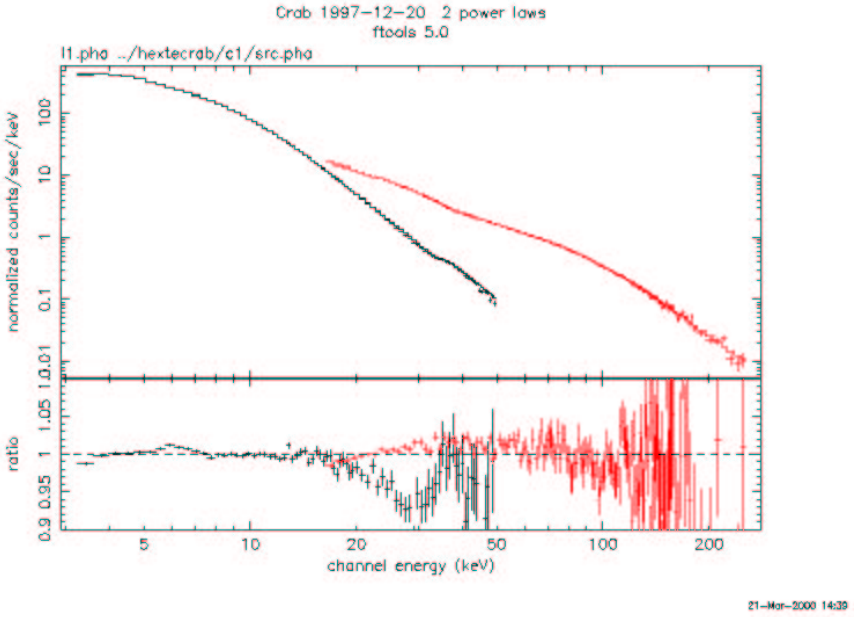


Ftools v5.0/pcarmf v7.01

Systematics are similar over life of mission.

	G(layer1)	G(total)
Apr 96	2.18	2.18
Dec 97	2.16	2.18
Jan 99	2.16	2.19
Oct 99	2.17	2.21

PCA – HEXTE comparison




```
mo = constant[1]( ( pegpwrlw[2] + pegpwrlw[3] )wabs[4] )
------------------------------------------------------------------------------
------------------------------------------------------------------------------
mo = constant[1]( ( pegpwrlw[2] + pegpwrlw[3] )wabs[4] )
Model Fit Model Component  Parameter  Unit     Value                      Data
par   par comp                                                          group
  1    1    1   constant   factor             1.000     frozen             1
  2    2    2   pegpwrlw   PhoIndex           2.218     +/-  0.1225E-02    1
  3    3    2   pegpwrlw   eMin       keV     2.000     frozen             1
  4    4    2   pegpwrlw   eMax       keV     10.00     frozen             1
  5    5    2   pegpwrlw   norm               2.249E+04 +/-   10.02        1
  6    8    3   pegpwrlw   PhoIndex           1.668     +/-  0.3614E-02    1
  7    9    3   pegpwrlw   eMin       keV     2.000     frozen             1
  8   10    3   pegpwrlw   eMax       keV     10.00     frozen             1
  9    5    3   pegpwrlw   norm               2249.     = par   5 *  0.1000
 10    6    4   wabs       nH         10^22   0.3000    frozen             1
 11    7    5   constant   factor             0.9541    +/-  0.1082E-02    2
 12    2    6   pegpwrlw   PhoIndex           2.218     = par   2          2
 13    3    6   pegpwrlw   eMin       keV     2.000     = par   3          2
 14    4    6   pegpwrlw   eMax       keV     10.00     = par   4          2
 15    5    6   pegpwrlw   norm               2.249E+04 = par   5          2
 16    8    7   pegpwrlw   PhoIndex           1.668     = par   6          2
 17    9    7   pegpwrlw   eMin       keV     2.000     = par   7          2
 18   10    7   pegpwrlw   eMax       keV     10.00     = par   8          2
 19    5    7   pegpwrlw   norm               2249.     = par   5 *  0.1000
 20    6    8   wabs       nH         10^22   0.3000    = par  10          2
------------------------------------------------------------------------------
------------------------------------------------------------------------------
Chi-Squared =      1176.778     using   307 PHA bins.
Reduced chi-squared =      3.883754     for    303 degrees of freedom
Null hypothesis probability =  0.00
```

Ftools 5.0 –

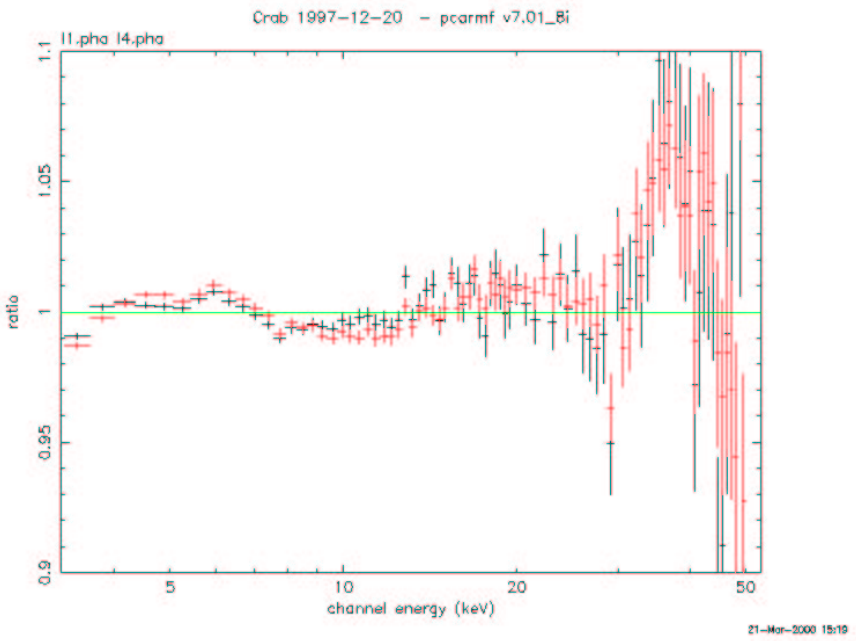
Individual fits to single power law give $\Gamma = 2.16, 2.08$

Joint fit to 2 power–laws shown

Single power law fits to faked data give $\Gamma = 2.15, 2.07$

Complex model required. Γ_2 and relative norm can be measured from phase resolved RXTE Crab data

PCARMF – next steps



cd ~ = 2.12, Layer 1 and total

Working version (7.01_8i)

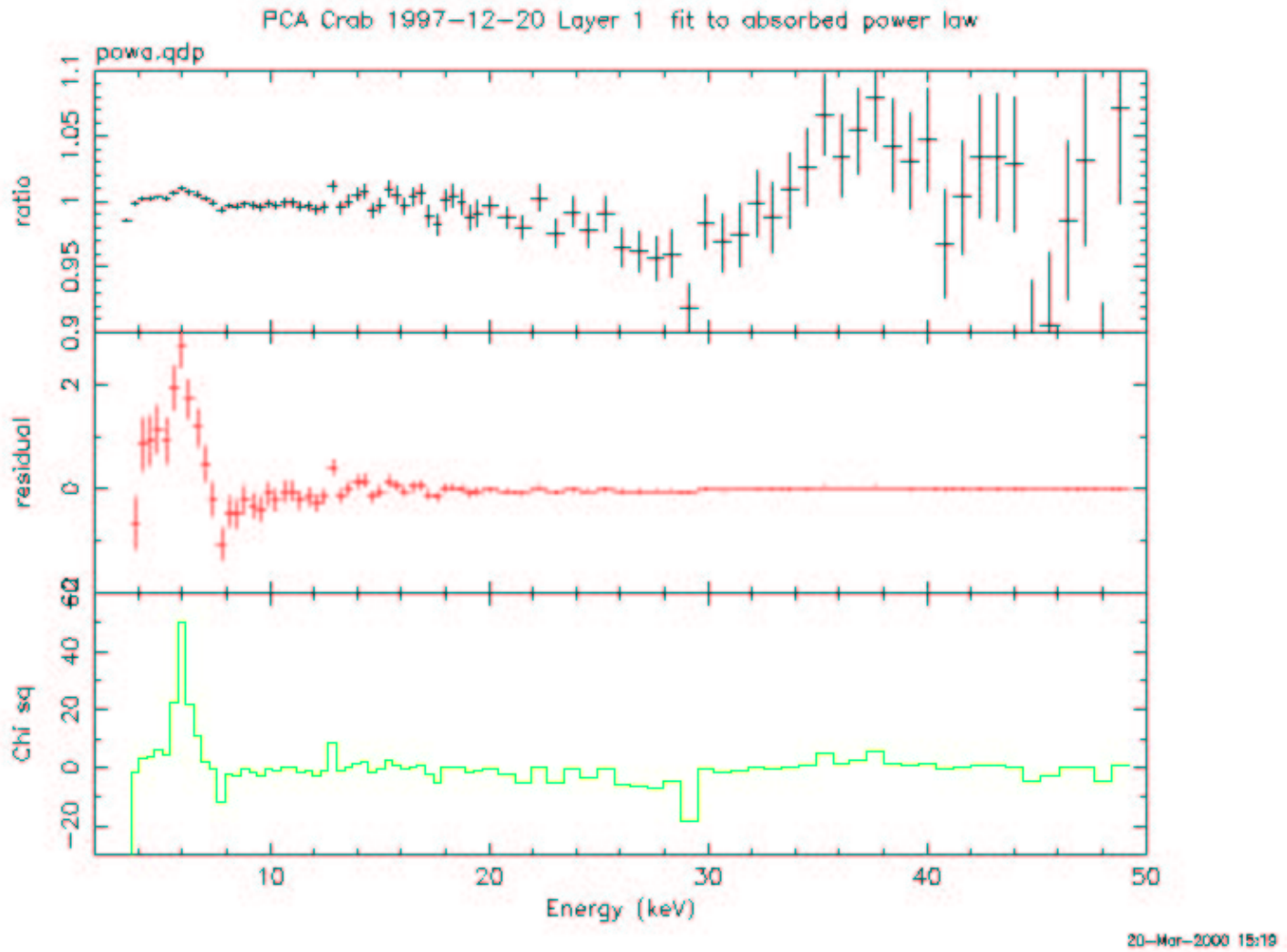
new parameterization of self vetoing at higher energies

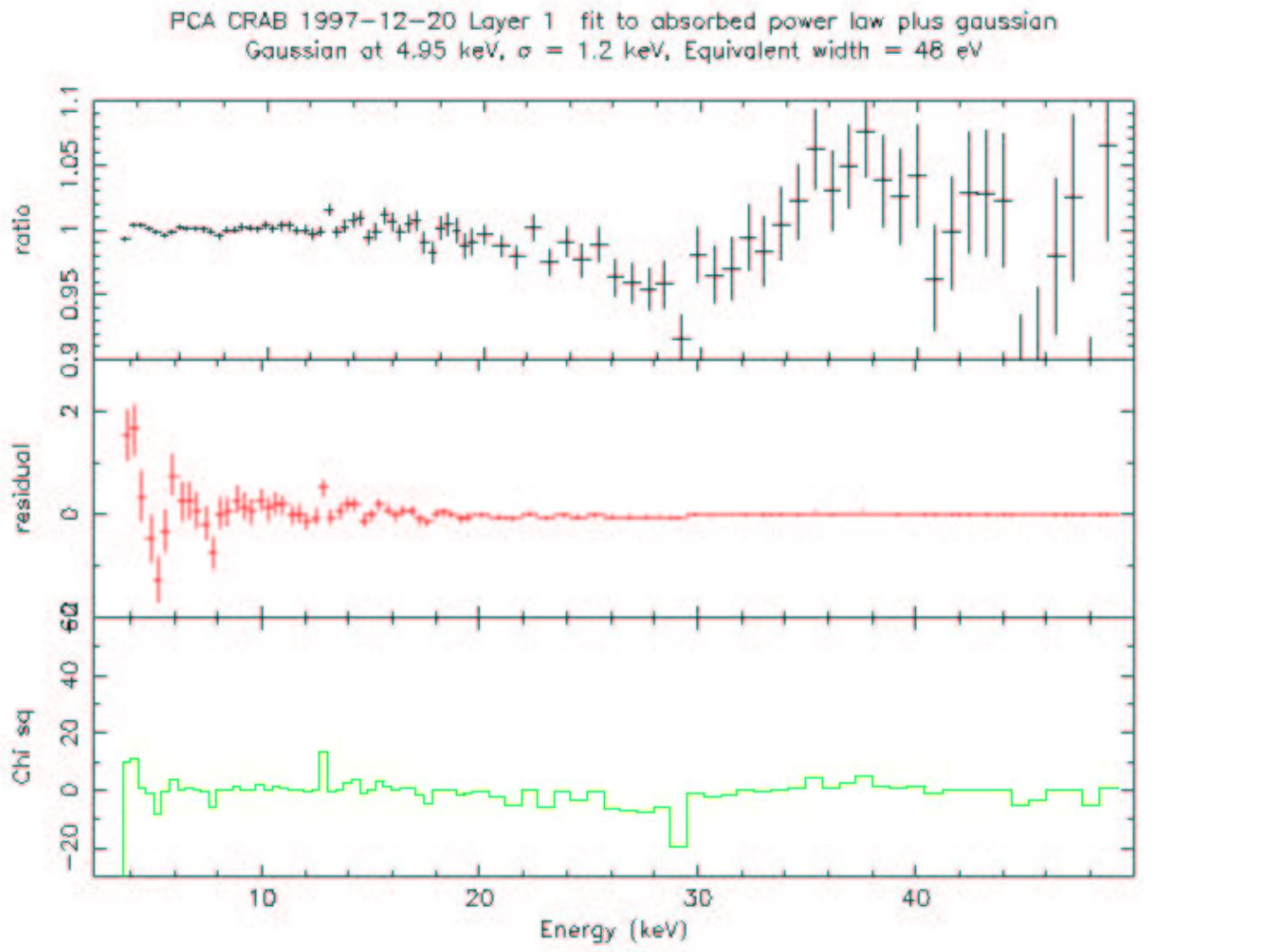
quadratic term in energy to channel relationship

adjusted gm/cm^2 Xe in layers 2 and 3

equivalent width of residuals at 6 and 35 keV ~ 40 and 400 eV

Comparsion with HEXTE ready for consistent treatment of phase resolved spectra


PCA Crab 1997-12-20 Layer 1 fit to absorbed power law
powa.qdp
ratio
residual
Chi sq
Energy (keV)
20-Mar-2000 15:19


PCA CRAB 1997-12-20 Layer 1 fit to absorbed power law plus gaussian
Gaussian at 4.95 keV, σ = 1.2 keV, Equivalent width = 48 eV
ratio
0.9
0.95
1
1.05
1.1
residual
-2
0
2
Chi sq
-20
0
20
40
60
10
20
30
40
Energy (keV)
20-Mar-2000 15:18